01-OSH-0499

U.S. Department of Energy
Office of River Protection
Mr. Michael K. Barrett
Contracting Officer
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

CCN: 024505

DEC 1 0 2001

Dear Mr. Barrett:

**CONTRACT NO. DE-AC27-01RV14136 – TRANSMITTAL FOR APPROVAL – AUTHORIZATION BASIS CHANGE NOTICE 24590-WTP-ABCN-ESH-01-013, REVISION 1, *CODES AND STANDARDS UPDATE/NPH DESIGN REQUIREMENTS***

Bechtel National, Inc. is submitting the attached Authorization Basis Change Notice Revision (ABCN), 24590-WTP-ABCN-ESH-01-013, Revision 1, to the U.S. Department of Energy, Office of River Protection, and the Office of Safety Regulation (OSR) for approval. Revision 0 is hereby withdrawn. This ABCN requests approval to (1) revise Safety Requirements Document (SRD) Safety Criteria (SC) 4.1-3 and 4.1-4 to change the Performance Category (PC)-3 categorization for Safety Design Class and Safety Design Significant controls that have a Natural Phenomenon Hazard (NPH) function for chemical hazards to PC-2, (2) revise the implementing standards citation in SC 4.1-2, 4.1-3, 4.1-4, and 4.1-5, and (3) incorporate standards tailoring to support the Partial Construction Authorization Request (PCAR).

This revision is necessary to provide additional clarification and detail relative to the specific changes to the text of SC 4.1-3 and 4.1-4 to implement the requested change and to incorporate standards tailoring to support the PCAR.

The basis of the change is alignment of the designation of PC for the Hanford Tank Waste Treatment and Immobilization Plant (WTP) facility with the commercial industry with respect to chemical hazards. The non-nuclear, chemical industry utilizes design standards that are embodied in the Uniform Building Code (UBC). The corresponding UBC requirements are implemented in the WTP design through the designation of PC-2. Additional changes have been made to standards referenced in SC 4.1-2, 4.1-3, 4.1-4, and 4.1-5 which are updates to the current version of the standards. One standard was added to SC 4.1-3, which reflects the current industry requirements for design of masonry structures. The tailoring additions and changes provide clarification of the application of standards as they apply to the WTP. The tailoring is consistent with the results of the Integrated Safety Management process and results in a set of standards that ensures the design is commensurate with the requisite safety functions to which it is applied.

The changes requested in this ABCN are consistent with the contents of the forthcoming PCAR submittal and are necessary to align the PCAR with the existing authorization basis. Approval is

requested by January 10, 2002, to support issuance of engineering design calculations and design drawings.

This change does not affect documents issued to support limited construction activities. The design requirements and standards embodied in this change are not required for evaluation of underground piping and foundation drawings issued to support excavation for the basemats.

These changes have been discussed with Mr. Lew Miller of the OSR.

An electronic copy of ABCN 24590-WTP-ABCN-ESH-01-013, Revision 1, is provided for the OSR's information and use.

Please contact Mr. Bill Spezialetti at (509) 371-4654 for any questions or comments.

Very truly yours,

A. R. Veirup
Prime Contract Manager

TR/slr

Attachment: Authorization Basis Change Notice (ABCN), 24590-WTP-ABCN-ESH-01-013, Revision 1, plus attachments

# Authorization Basis Change Notice



ABCN Number 24590-WTP-ABCN-ESH-01-013 Revision 1

ABCN Title Codes & Standards Update / NPH Design Requirements

## I. ABCN Review and Approval Signatures

### A. ABCN Preparation

| | | | | |
|---|---|---|---|---|
| Preparer: | David Houghton (CS&A) | D Houghton | 12/6/01 | |
| | *Print/Type Name* | *Signature* | *Date* | |
| Reviewer: | Scott Horn (CS&A) | | 12/6/01 | |
| | *Print/Type Name* | *Signature* | *Date* | |

### B. Required Reviewers

Review Required? *For each person checked Yes, that signature block must be completed.*

| | | | | |
|---|---|---|---|---|
| ☒ | ES&H Manager | F Beranek | | 12/6/01 |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☒ | QA Manager | G Shell | | 12/6/01 |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☒ | PSC Chair | B Poulson | | 12/6/01 |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | Operations Manager | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☒ | Engineering Manager | F Marsh | | 12/6/01 |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | Pretreatment APM | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | LAW APM | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | HLW APM | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | BOF APM | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | Construction Manager | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | Business/Project Controls Manager | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☐ | ALARA PSC Subcommittee Chair | | | |
| | | *Print/Type Name* | *Signature* | *Date* |
| ☒ | Safety Analysis Manager | Richard Garrett | | 12/6/01 |
| | | *Print/Type Name* | *Signature* | *Date* |

# Authorization Basis Change Notice



ABCN Number 24590-WTP-ABCN-ESH-01-013 Revision 1

ABCN Title Codes & Standards Update / NPH Design Requirements

C. **ABCN Approval**

WTP Project Manager R Naventi 12/6/07
*Print/Type Name* *Signature* *Date*

## II. Description of the Proposed Change to the Authorization Basis

D. Affected AB Documents:

| Title | Document Number | Revision |
|---|---|---|
| Safety Requirements Document, Volume II | 24590-WTP-SRD-ESH-01-001-02 | 0a |

Decision to Deviate ☐ Yes ☒ No

If yes, DTD Number _____ Deficiency Report Number _____

Initiating Document Number _____ Revision _____

E. Describe the proposed changes to the Authorization Basis Documents:

Revision 1 provides additional descriptive information on the change to the NPH Design Requirements and incorporates additional standards tailoring in SRD Attachment C. ~~This revision does not alter the technical content or the justification for the changes previously reviewed and approved in Revision 0.~~

**NPH Design Requirements**

Revise the NPH design requirements in SRD 4.1-3 for SSC's designated SDC/SDS solely on the basis of chemical consequence from PC-3 to PC-2.

To accomplish this change, safety criterion (SC) 4.1-3 is revised to remove/exclude SSCs designated as SDC or SDS based solely on chemical hazards and SC 4.1-4 is revised to include SSCs required to protect workers and members of the public from chemical hazards with an NPH safety function.

The specific text changes are as follows:

SC 4.1-3

Third paragraph – Delete last sentence relative to chemical hazard SSCs.

Fourth paragraph – Insert "(excepting those so designated based solely on chemical hazards)" into the first sentence and delete last sentence relative to chemical hazard SSCs.

Fifth paragraph – Delete last sentence relative to chemical hazard SSCs.

SC 4.1-4

Insert after first paragraph "This criterion also addresses SSCs required to protect workers and members of the public from exposure to chemical hazards with an NPH safety function."

**Codes & Standards**

Revise the citation of the following previously approved implementing standards as identified in safety criteria 4.1-2, 4.1-3, ~~and~~ 4.1-4, and 4.1-5 ~~and section 2.0 of Appendix C of the SRD~~:

1. ACI 349-97 and ACI 349R-97 to ACI 349-01and ACI 349R-01 respectively, with tailoring for seismic proportioning and detailing.
   (Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary)

2. ACI 530-95 to ACI 530-99.

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ABCN Title Codes & Standards Update / NPH Design Requirements

E. Describe the proposed changes to the Authorization Basis Documents:

(Building Code Requirements for Masonry Structures)

3. ASCE 4-98 (Draft) to ASCE 4-98.
(Seismic Analysis of Safety-Related Nuclear Structures and Commentary)

4. IEEE Std 344-1987 to IEEE Std 344-1987(R1993).
(Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations)

Add ACI 530-99 to list of implementing standards in section 4.1-3,

Include tailoring of the following standards referenced in SRD Safety Criteria 4.1-3 and 4.1-4 in SRD Attachment C (see attached changes for details):

ANSI/AISC N690

ACI 318

ACI 349

AISC M016

UBC 97

F. List associated ABCNs and AB documents, if any:

No other ABCNs for this change.

G. Explain why the change is needed:

**NPH Design Requirements**

The basis for the change is to align the designation of Performance Category (PC) for the RPP-WTP facility with that of the commercial ~~industry~~industry with respect to chemical hazards~~.~~ Currently the SRD (Section 4.1-3) requires an SSC designated either SDC or SDS, based solely on a safety function relative to chemical hazard, to meet PC-3 design requirements. The non-nuclear, chemical industry, utilize design standards embodied in the Uniform Building Code. The Uniform Building Code is implemented into the RPP-WTP design through the designation of PC-2.

This change is needed to allow the LAW facility to be designed and constructed commensurate with the potential hazards associated with the facility and not "over design" the facility to meet codes and standards intended for facilities with large radioactive inventories.

**Codes & Standards**

The basis for the change to the standards listed above is that the new standards reflect the most current design information from the industry for seismic and other natural phenomena hazards.

1. ACI 349-01 reflects the most current methodology endorsed by the American Concrete Institute for concrete structures subject to seismic loading. ACI 349-01 also contains the latest methodology for the design of anchor bolts, in addition to updates to the previous version of the code. Seismic proportioning and detailing will be in accordance with ACI 318-99 Chapter 21 in lieu of ACI 349-01 Chapter 21, this being the most current detailing methodology.
2. ACI 530-99 reflects the most current methodology endorsed by the American Concrete Institute for masonry design. Seismic proportioning and detailing pertaining to Seismic Performance Category 'D' will be adopted.
3. ASCE 4-98 reflects the most current methodology endorsed by the American Society of Civil Engineers for the Seismic Analysis of Safety-Related Nuclear Structures. ASCE 4-98 now replaces the 'Draft' version

# Authorization Basis Change Notice



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ABCN Title Codes & Standards Update / NPH Design Requirements

G. Explain why the change is needed:

previously available.

4. IEEE Std 344-1987(R1993) reflects the most current methodology endorsed by the Institute of Electrical & Electronic Engineers. IEEE Std 344-1987(R1993) is the most recent publishes 're-approval' of the 1987 code.

The addition of ACI 530-99 to section 4.1-3 is to cover masonry design in a Seismic Category I/II facility. (Note: ACI 530 already exists as referenced in Safety Criteria 4.1-2 and 4.1-4 of the SRD)

Tailoring of standards described in the additions to SRD Attachment C provide clarification of the application of standards as they apply to the WTP. This tailoring is consistent with the results of the application of the ISM process and represents a set of standards that ensures the design is commensurate with the requisite safety functions to which it is applied. Specific tailoring applications and justifications for the tailoring are included in the attached change description.

H. List the implementation activities and the projected completion dates:

| Activity | Date |
|---|---|
| Inform DOE that AB has been revised and formally transmit electronic changes | 14 days from DOE approval |
| Distribute revised controlled page changes | 30 days from DOE approval |
| ~~Inform DOE that AB has been revised~~ | ~~30 days after DOE approval~~ |
| ~~Distribute revised pages~~ | ~~14 days after DOE approval~~ |
| ~~Provide updated electronic version of AB to DOE~~ | ~~30 days after DOE approval~~ |

Revise the following implementing documents:

| Documents | Describe extent of revisions | Date |
|---|---|---|
| 1 n/a | | |
| 2 n/a | | |

| Describe other activities: | Date |
|---|---|
| 1 Ensure updated standards are reflected in ~~appropriate~~appropriate design media and associated DIMs. | Next revision of applicable documents |
| 2 n/a | |

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ABCN Title Codes & Standards Update / NPH Design Requirements

## III. Evaluation of the Proposed Change

I. Is DOE prior approval required?

1 Does the revision involve the deletion or modification of a standard previously identified or established in the SRD? **Yes** ☒ **No** ☐

Explain

Modifications to previously identified standard are described in Section G above.

2 Does the revision result in the reduction in commitment currently described in the AB? **Yes** ☒ **No** ☐

Explain

**NPH Design Requirements**

Changing the NPH design requirements for SSCs that are solely for control of chemical hazards from PC-3 to PC-2 is a reduction in commitment. PC-3 design requirements are more stringent than PC-2 design requirements.

**Codes and Standards**

The revisions to previously identified implementing codes and standards in the SRD reflect the most current design information from the industry for seismic and other natural phenomena hazards. The changes to the codes and standards will result in the application of more conservative design requirements. The requested code and standards changes do not reflect a reduction in commitment currently described in the AB.

The standards tailoring additions to SRD Attachment C provide clarifications of applications and apply requirements consistent with the standards identified in the SRD. These changes therefore do not represent a reduction in commitment currently described in the AB.

3 Does the revision result in a reduction in the effectiveness of any procedure, program, plan, or management process described in the AB? **Yes** ☐ **No** ☒

Explain

This change is not associated with any procedure, program, plan, or management process.

J. Complete the safety evaluation by describing how the revision to the AB:

1 will continue to comply with all applicable laws and regulations, conform to top-level safety standards, and provide adequate safety

No specific laws or Federal regulations are associated with the selection of alternative standards for the SRD.

The top-level safety standards applicable to the proposed changes to the SRD are those cited as regulatory bases in the various Safety Criteria proposed for revision. The following provides the title or subject of each top-level safety standard so cited, and a brief discussion showing that conformance to the standard is maintained.

**4.1-3 & 4.1-4**

*DOE/RL-96-0006 4.2.2.2 Proven Engineering Practices/Margins-Common-Mode/Common-Cause Failure*

Substitution of the UBC seismic requirements for SSCs designed against chemical hazards is consistent with proven engineering practice, as evidenced by the discussion in the preceding sections of this evaluation. Similarly, the code and standard revisions and tailoring are also consistent with proven engineering practice.

**4.1-2**

*DOE/RL-96-0006 4.1.2.4 Safety Responsibility-Operating Experience and Safety Research*

*DOE/RL-96-0006 4.1.5.1 Configuration Management-Formal Configuration Management*

*DOE/RL-96-0006 4.1.6.2 Quality Assurance-Established Techniques and Procedures*

*DOE/RL-96-0006 4.2.2.1 Proven Engineering Practices/Margins-Proven Engineering Practices*

*DOE/RL-96-0006 4.2.2.3 Proven Engineering Practices/Margins-Safety System Design and Qualification*

*DOE/RL-96-0006 4.2.5.1 Inherent/Passive Safety Characteristics-Safety Margin Enhancement*

The proposed code changes and tailoring are equivalent or more conservative as evidenced in the previous discussion and maintain conformance to the cited top level safety standards.

Revision of the NPH design requirements specified in SC's 4.1-3 and 4.1-4 is proposed to make the design of the WTP, with respect to chemical hazards, consistent with commercial industry practice. PC-3 requirements are intended to provide design requirements for SSCs needed to protect workers and the public from hazards not normally encountered in the chemical industry. These are the radiological hazards unique to (in this case) a nuclear waste processing plant. The chemical industry has proven NPH design requirements for SSCs needed to protect workers and the public from chemical hazards, many of which far exceed the chemical hazards at the WTP. These design requirements are contained in the Uniform Building Code. The UBC forms the basis for PC-2. By revising the NPH design criteria in the SRD, the WTP is more consistent with commercial chemical industry practice, will not "over-design" the facility, and will continue to provide adequate safety to workers and the public.

2 will continue to conform to the original submittal requirements associated with the AB documents being revised

These changes do not alter the content or format of the SRD in a manner that results in non conformance with the original submittal requirements, namely the actual SRD and the associated safety evaluation report (RL/REG-98-20, *DOE Regulatory Unit Evaluation of BNFL Inc. Safety Requirements Document*).

3 will not result in inconsistencies with other commitments and descriptions contained in the AB or an authorization agreement

Changes to standards in the SRD do not result in inconsistencies with other commitments in the AB since standard identification is unique to the SRD. The Limited Construction Authorization Request (LCAR) and the Limited Construction Authorization Agreement do not discuss standards specifically, but reference the SRD as a basis for approval of the authorization agreement.

K. Justification of the Proposed Change

**NPH Design Requirements**

The designation of Performance Category 3 is intended to address significantly larger hazards encountered at the RPP-WTP facility than there are in the non-nuclear industry (~~ie~~ i.e., the large radioactive material inventories). This standard was not intended to be applied to chemical hazards at WTP. The chemical hazards routinely encountered in the RPP-WTP facility are significantly smaller, both in quantity and toxicity, than those present in chemical industry facilities. These non-nuclear industries have developed NPH design requirements to deal with the associated chemical hazards. These requirements are embodied in the Uniform Building Code, which is implemented at the WTP facilities as Performance Category 2.

This revision is consistent with industry practice for chemical hazards.

**Codes and Standards**

The revisions to previously identified implementing codes and standards in the SRD reflect the most current design information from the industry for seismic and other natural phenomena hazards. Justifications for specific additions to SRD Appendix C are included as part of the attached change descriptions.

L. Certification of Continued SRD Adequacy

Based on evaluations from III.1.1 and III.J.1. If question III.1.1 is marked "yes, Project Manager certification is required. The Project Manager's signature certifies that the revised SRD continues to identify a set of standards that provide adequate safety, complies with WTP applicable laws and regulations, and conforms with top-level safety standards and principles. This certification is based on adherence to the DOE/RL-96-0004 standards identification process and successful completion of review and confirmation by the PSC.

WTP Project Manager: Ron Naventi *Print/Type Name* *Signature* 12/10/01 *Date*

M. List of Attachments

1. Copies of the affected AB document(s) or appropriate excerpt(s) showing the proposed revision(s).

SSCs that are designated Safety Design Class (excepting those so designated based solely on chemical hazards) and that are required to perform a safety function as a result of a given NPH shall be designed to withstand the NPH loadings of that NPH as provided in Table 4-1. These SSCs are designated Seismic Category I (SC-I) for earthquakes and Performance Category 3 (PC-3) for other NPH. ~~SSCs designated as Safety Design Class based solely on a safety function relative to chemical hazards shall be designated as SC-III for earthquakes, and shall be designed to meet PC-3 requirements for other NPH events.~~

SSCs that are designated Safety Design Significant (excepting those so designated based solely on chemical hazards) whose continued function is not required for an NPH event, but whose failure as a result of an NPH event could reduce the functioning of a Safety Design Class SSC such that exposure standards might be exceeded, shall be designed to withstand the NPH loadings of that NPH as provided in Table 4-1. For these SSCs, however, for seismic response only, credit may be taken for inelastic energy absorption per Table 2-4 of DOE-STD-1020-94. These SSCs are designated SC-II for earthquakes and PC-3 for other NPH. ~~SSCs designated as Safety Design Significant based solely on a safety function relative to chemical hazards shall be designated as SC-III for earthquakes, and shall be designed to meet PC-3 requirements for other NPH events.~~

~~For any SSC included under this criterion, other NPH loads (for which the SSC has no safety function) may be taken from Safety Criterion 4.1-4 and Table 4-2 in lieu of Safety Criterion 4.1-3 and Table 4-1. SSCs designated as Safety Design Significant based solely on safeguarding a safety function relative to chemical hazards shall be designated SC-III for earthquakes, and shall be designed to meet PC-2 requirements for other NPH events.~~

**Table 4-1. Natural Phenomena Design Loads for Important to Safety SSCs with NPH Safety Functions**

| Hazard | Load | Source Document for Load |
|---|---|---|
| Seismic | DBE with<br>0.26 *g* horizontal PGA and<br>0.18 *g* vertical PGA<br>See Figures 4-1 and 4-2 | WHC-SD-W236A-TI-002 [a]<br>DOE-STD-1020-94 [b] |
| Straight wind | 111 mi/hr , 3-second gust, at 33 ft above ground, Importance factor, I=1.0 | DOE Newsletter [c] |
| Wind Missile | 2x4 timber plank, 15 lb at 50 mi/hr (horiz), Max height 30 ft | DOE-STD-1020-94 [b] |
| Tornado and Tornado Missiles | Not Applicable | DOE-STD-1020-94 [b] |
| Volcanic ash | 12.5 lb/ft$^2$ | HNF-SD-GN-ER-501 [d] |
| Flooding | Dry site for river flooding<br>Local precipitation: 4 in. for 6 hours | HNF-SD-GN-ER-501 [d] |
| Snow | 15.0 lb/ft$^2$ snow load | HNF-SD-GN-ER-501 [d] |

[a] Geomatrix, 1996, *Probabilistic Seismic Hazard Analysis DOE Hanford Site, Washington*, WHC-SD-W236A-TI-002, Rev.1A, prepared for Westinghouse Hanford Company, Richland, Washington.

[b] DOE STD-1020-94, (1996, Change 1) *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*, U.S. Department of Energy, Washington, D.C., 1996.

[c] DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98.

[d] HNF-SD-GN-ER-501, Rev. 1, "Natural Phenomena Hazards, Hanford Site, South-Central Washington", Westinghouse Hanford Company.

SSCs that are designated Safety Design Class (excepting those so designated based solely on chemical hazards) and that are required to perform a safety function as a result of a given NPH shall be designed to withstand the NPH loadings of that NPH as provided in Table 4-1. These SSCs are designated Seismic Category I (SC-I) for earthquakes and Performance Category 3 (PC-3) for other NPH. ~~SSCs designated as Safety Design Class based solely on a safety function relative to chemical hazards shall be designated as SC-III for earthquakes, and shall be designed to meet PC-3 requirements for other NPH events.~~

SSCs that are designated Safety Design Significant (excepting those so designated based solely on chemical hazards) whose continued function is not required for an NPH event, but whose failure as a result of an NPH event could reduce the functioning of a Safety Design Class SSC such that exposure standards might be exceeded, shall be designed to withstand the NPH loadings of that NPH as provided in Table 4-1. For these SSCs, however, for seismic response only, credit may be taken for inelastic energy absorption per Table 2-4 of DOE-STD-1020-94. These SSCs are designated SC-II for earthquakes and PC-3 for other NPH. ~~SSCs designated as Safety Design Significant based solely on a safety function relative to chemical hazards shall be designated as SC-III for earthquakes, and shall be designed to meet PC-3 requirements for other NPH events.~~

~~For any SSC included under this criterion, other NPH loads (for which the SSC has no safety function) may be taken from Safety Criterion 4.1-4 and Table 4-2 in lieu of Safety Criterion 4.1-3 and Table 4-1. SSCs designated as Safety Design Significant based solely on safeguarding a safety function relative to chemical hazards shall be designated SC-III for earthquakes, and shall be designed to meet PC-2 requirements for other NPH events.~~

**Table 4-1. Natural Phenomena Design Loads for Important to Safety SSCs with NPH Safety Functions**

| Hazard | Load | Source Document for Load |
|---|---|---|
| Seismic | DBE with<br>0.26 *g* horizontal PGA and<br>0.18 *g* vertical PGA<br>See Figures 4-1 and 4-2 | WHC-SD-W236A-TI-002 [a]<br>DOE-STD-1020-94 [b] |
| Straight wind | 111 mi/hr , 3-second gust, at 33 ft above ground, Importance factor, I=1.0 | DOE Newsletter [c] |
| Wind Missile | 2x4 timber plank, 15 lb at 50 mi/hr (horiz), Max height 30 ft | DOE-STD-1020-94 [b] |
| Tornado and Tornado Missiles | Not Applicable | DOE-STD-1020-94 [b] |
| Volcanic ash | 12.5 lb/ft$^2$ | HNF-SD-GN-ER-501 [d] |
| Flooding | Dry site for river flooding<br>Local precipitation: 4 in. for 6 hours | HNF-SD-GN-ER-501 [d] |
| Snow | 15.0 lb/ft$^2$ snow load | HNF-SD-GN-ER-501 [d] |

[a] Geomatrix, 1996, *Probabilistic Seismic Hazard Analysis DOE Hanford Site, Washington*, WHC-SD-W236A-TI-002, Rev.1A, prepared for Westinghouse Hanford Company, Richland, Washington.

[b] DOE STD-1020-94, (1996, Change 1) *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*, U.S. Department of Energy, Washington, D.C., 1996.

[c] DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98.

[d] HNF-SD-GN-ER-501, Rev. 1, "Natural Phenomena Hazards, Hanford Site, South-Central Washington", Westinghouse Hanford Company.

**Implementing Codes and Standards**

ACI 349-01~~97~~ Code Requirements for Nuclear Safety-Related Concrete Structures
ACI 349R-01~~97~~ Commentary on Code Requirements for Nuclear Safety-Related Concrete Structures
ACI 530-99 Building Code Requirements for Masonry Structures and Commentary
ANSI/AISC N690-94 Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities
ASCE 4-98 ~~(Draft)~~ Seismic Analysis of Safety-Related Nuclear Structures and Commentary
ASCE 7-95 Minimum Design Loads for Buildings and Other Structures
DOE-STD 1020-94 (Change 1, 1996) Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities
IEEE 344-1987 (R1993) Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations
1997 UBC Uniform Building Code
DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98
24590-WTP-SRD-ESH-01-001-02, Appendix A, Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis**

*DOE/RL-96-0006* *4.2.2.2 Proven Engineering Practices/Margins-Common-Mode/Common-Cause Failure*

**Safety Criterion: 4.1 - 4**

This criterion addresses natural phenomena hazards (NPH) design for structures, systems, and components (SSCs) without NPH safety functions.

This criterion also addresses SSCs required to protect workers and members of the public from exposure to chemical hazards with an NPH safety function

SSCs that may be important to the safety of the RPP-WTP shall be designed to withstand the effects of NPH such as earthquakes, wind, and floods. The SSCs included under this criterion are:

1. SSCs Important to Safety (either Safety Design Class or Safety Design Significant) that do not have an NPH safety function,
2. SSCs that are not Important to Safety and that have significant inventories of radioactive or hazardous materials but in amounts less than quantities that might lead to an Important to Safety designation, and
3. SSCs that are important to safety because of their function to protect workers and members of the public from exposure to chemical hazards.

These SSCs are designated Seismic Category III (SC-III) for earthquakes and Performance Category 2 (PC-2) for other NPH.

SSCs included under this criterion shall be designed to withstand the NPH loadings as provided in Table 4-2.

**Table 4-2. Natural Phenomena Design Loads for SSCs without NPH Safety Functions**

| Hazard | Load | Source Document for Load |
|---|---|---|
| Seismic | Uniform Building Code [a], Static Force Procedure | DOE-STD-1020-94 [b] |
| Straight wind | 91 mi/hr 3-second gust, at 33 ft above ground, Importance factor, I=1.00 | DOE Newsletter [c] |
| Wind Missile | Not Applicable | DOE-STD-1020-94 [b] |
| Tornado and Tornado Missiles | Not Applicable | DOE-STD-1020-94 [b] |
| Volcanic ash | 5 $lb/ft^2$ | HNF-SD-GN-ER-501 [d] |
| Flooding | Dry site for river flooding<br>Local Precipitation: 2.5 in. for 6 hours | HNF-SD-GN-ER-501 [d] |
| Snow | 15.0 $lb/ft^2$ snow load | HNF-SD-GN-ER-501 [d] |

[a] 1997, *Uniform Building Code*, International Conference of Building Officials, Whittier, California.

[b] DOE STD-1020-94, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*, U.S. Department of Energy, Washington, D.C., Change 1, 1996.

[c] DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98

[d] HNF-SD-GN-ER-501, Rev. 1, "Natural Phenomena Hazards, Hanford Site, South-Central Washington", Westinghouse Hanford Company

**Implementing Codes and Standards**

ACI 318-99 Building Code Requirements for Structural Concrete
ACI 318R-99 Commentary on Building Code Requirements for Structural Concrete
AISC MO16-89 Manual for Steel Construction - Allowable Stress Design, Ninth Edition
ASCE 7-95 Minimum Design Loads for Buildings and Other Structures
DOE-STD 1020-94 (Change 1, 1996) Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities
1997 UBC Uniform Building Code
ACI 530-99S Building Code Requirements for Masonry Structures and Commentary
DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98
24590-WTP-SRD-ESH-01-001-02, Appendix A, Implementing Standard for Safety Standards and Requirements Identification

**Regulatory Basis**

*DOE/RL-96-0006* *4.2.2.2 Proven Engineering Practices/Margins-Common-Mode/Common-Cause Failure*

**Safety Criterion: 4.1 - 5**

Structures, systems, and components designated as Safety Design Class shall be appropriately protected against dynamic effects (e.g., the effects of missiles, pipe whipping, and discharging fluids) that may result from failures of moderate and high energy systems or other accident conditions.

In consideration of the need to protect structures, systems, and components which are designated as Safety Design Class from these dynamic effects, the failure of the moderate or high energy system need not be postulated to occur simultaneously with an accident unless the events are causally related.

**Implementing Codes and Standards**

ACI 349-01~~97~~ Code Requirements for Nuclear Safety-Related Concrete Structures
ACI 349R-01~~97~~ Commentary on Code Requirements for Nuclear Safety-Related Concrete Structures
ANSI/AISC N690-94 Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities
ASCE 4-98 ~~(Draft)~~ Seismic Analysis of Safety-Related Nuclear Structures and Commentary
ASCE 7-95 Minimum Design Loads for Buildings and Other Structures
DOE-STD 1020-94 (Change 1, 1996) Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities
DOE Newsletter (Interim Advisory on Straight Winds and Tornados) Dated 1/22/98

**Safety Criterion: 4.1 - 6**

Adequate provisions for facility security and physical protection of structures, systems, and components Important to Safety shall be provided.

**Implementing Codes and Standards**

PL-W375-MG0004, Safeguards and Security Program Plan

**Regulatory Basis**

*DOE/RL-96-0006 4.3.6.1 Security-Security*

## 3.0 ANSI/AISC N690, "Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities"

Revision: 1994

Sponsoring Organization: American National Standards Institute/American Institute of Steel Construction

RPP-WTP Specific Tailoring

The following tailoring of ANSI/AISC N690 is required for use by the RPP-WTP contractor as an Implementing Standard for structural design.

**Page 22, Section Q1.5.7.1 Primary Stresses**

Revise the stress limit coefficients for compression in Table Q1.5.7.1 as follows:

- 1.3 instead of 1.5 [stated in footnote (c)] in load combinations 2, 5, and 6
- 1.4 instead of 1.6 in load combinations 7, 8, and 9
- 1.6 instead of 1.7 in load combination 11

**Justification:** These changes are made for consistency with the NRC requirements of Appendix F of Section 3.8.4 of NUREG-0800 (Draft Rev. 2).

**Page 22, Section Q1.5.7.1 Primary Stresses**

Delete the following load combinations:

4. D + L + Eo

6. D + L + Ro + To + Eo

**Justification:** These load combinations are required for evaluation of an Operation Basis Earthquake (OBE). The WTP project has not identified an OBE event.

# X1.0 ACI 349, Code Requirements for Nuclear Safety-Related Concrete Structures

Revision: 2001
Sponsoring Organization: American Concrete Institute

RPP-WTP Specific Tailoring

The following tailoring of ACI 349-01 is required for use by the RPP-WTP contractor as an Implementing Standard for structural design.

## Chapter 21 Seismic Proportioning and Detailing

Replace Chapter 21 of ACI 349-01 with Chapter 21 of ACI 318-99

**Justification:** Chapter 21 of ACI 349-01 is based on criteria from ACI 318-95. The American Concrete Institute completed a major revision of ACI 318 between the years 1995 and 1999 with respect to seismic proportioning and detailing. The RPP-WTP Project wishes to adopt the most current methodology as presented in ACI 318-99 in lieu of that presented in ACI 349-01 Chapter 21.

## X2.0 ACI 318, Building Code Requirements for Structural Concrete and Commentary

Revision: 1999
Sponsoring Organization: American Concrete Institute

WTP Specific Tailoring

The following tailoring of ACI 318-99 is required for use by the WTP contractor as an Implementing Standard for design of reinforced concrete for Seismic Category III, SSCs as noted.

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**Chapter 9, Section 9.2, Required Strength**

The following additional load combinations from the Uniform Building Code, 1997, Section 1612.2.1, shall be included in the load combinations evaluated for design of reinforced concrete:

Equation (12-5): $1.2D + 1.0E + (f_1L + f_2S)$

Equation (12-6): $0.9D \pm (1.0E \text{ or } 1.3W)$

**Justification:** The additional load combinations implement are not identified in the ACI load combinations. These combinations are evaluated to ensure adequate equivalency with commercial design in accordance with the UBC.

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**Chapter 21, Section 21.2.1.3**

Seismic detailing requirements for "moderate seismic risk" will be used.

**Justification:** The "moderate seismic risk" classification is consistent with the Seismic Category III, which is an important facility in seismic zone 2B.

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**General, (no specific Chapter)**

Design of concrete anchorage will following the requirements of PCA Publication, EB 080.01, *Strength Design of Anchorage to Concrete.*

**Justification:** This design standard represents the current industry approach to design of concrete embedments. This design method has been adopted by ACI 349, committee and used in the 2001 edition for Appendix B. The load factors are lower than those identified for safety related structures applicable to higher seismic classification. The load factors in this publication are appropriate for use in important commercial structures commensurate with SC-III.

## X3.0 AISC M016, Manual of Steel Construction, Allowable Stress Design (ASD)

Revision: 199?
Sponsoring Organization: American Institute of Steel Construction

WTP Specific Tailoring

The following tailoring of M016, is required for use by the WTP contractor as an Implementing Standard for design of structural steel for Seismic Category III, SSCs.

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**No specific section**

Load combinations for design of structural steel members utilize those identified in UBC 97, Section 1612.3.

**Justification:** These load combinations represent the commercial requirements for allowable stress design of structural steel. Use of these load combinations will ensure compliance with the commercial design in accordance with the UBC.

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**No specific section**

Seismic detailing requirements shall be in accordance with the UBC 97, Chapter 22, Division V, Section 2214, for moderate seismic risk structures.

**Justification:** The requirements contained in this section contain accepted industry practice for design of important commercial steel structures. Use of this section will ensure compliance with the commercial design in accordance with the UBC.

## X4.0 UBC 97, Uniform Building Code

Revision: 1997
Sponsoring Organization: International Conference of Building Officials

WTP Specific Tailoring

The following tailoring of UBC 97, is required for use by the WTP contractor as an Implementing Standard for design of reinforced concrete for Seismic Category III SSCs as noted.

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**Division II, Snow**

Design for snow loads shall be in accordance with ASCE 7, Minimum Design Loads for Buildings and Other Structures, Section 7.0, utilizing ground snow loads identified in Safety Criterion 4.1-4.

**Justification:** This approach to design of snow loads is an acceptable industry practice for evaluation of structures under snow loads. This code is more thorough in its consideration of these loads than the UBC methodology.

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**Division III, Wind**

Design for wind loads shall be in accordance with ASCE 7, Minimum Design Loads for Buildings and Other Structures, Section 6.0, utilizing 3-second gust values identified in Safety Criterion 4.1-4.

**Justification:** This approach to design of wind loads is an acceptable industry practice for evaluation of structures under wind loads. This code is more thorough in its consideration of these loads than the UBC methodology.